Use of polyvinyl alcohol for chimeric antigen receptor T-cell expansion.

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Authors: Toshinobu Nishimura, Ian Hsu, Daniel C Martinez-Krams, Yusuke Nakauchi, Ravindra Majeti, Satoshi Yamazaki, Hiromitsu Nakauchi, Adam C Wilkinson

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Public Summary:
The development of improved methods to grow cells in vitro for cell therapies, such as chimeric-antigen receptor (CAR) T cell therapies, is an important goal to improve the safety, efficiency, and cost of these therapies. In this manuscript, we develop polyvinyl alcohol-based media for the generation and expansion of CAR T cells.

Scientific Abstract:
Serum albumin has long been an essential supplement for ex vivo hematopoietic and immune cell cultures. However, serum albumin medium supplements represent a major source of biological contamination in cell cultures and often cause loss of cellular function. As serum albumin exhibits significant batch-to-batch variability, it has also been blamed for causing major issues in experimental reproducibility. We recently discovered the synthetic polymer polyvinyl alcohol (PVA) as an inexpensive, Good Manufacturing Practice-compatible, and biologically inert serum albumin replacement for ex vivo hematopoietic stem cell cultures. Importantly, PVA is free of the biological contaminants that have plagued serum albumin-based media. Here, we describe that PVA can replace serum albumin in a range of blood and immune cell cultures including cell lines, primary leukemia samples, and human T lymphocytes. PVA can even replace human serum in the generation and expansion of functional chimeric antigen receptor (CAR) T cells, offering a potentially safer and more cost-efficient approach for this clinical cell therapy. In summary, PVA represents a chemically defined, biologically inert, and inexpensive alternative to serum albumin for a range of cell cultures in hematology and immunology.